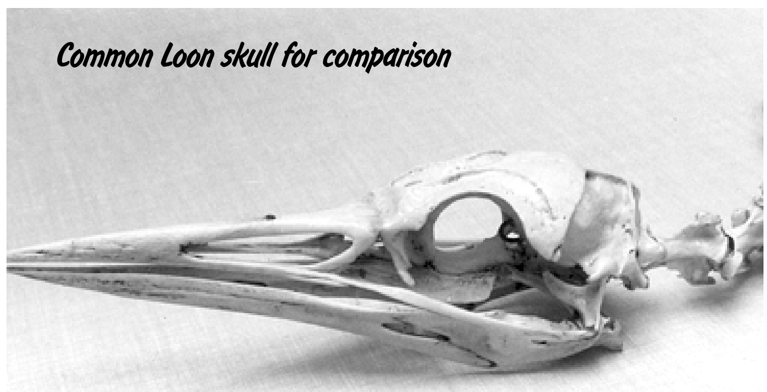
# CHAPTER ONE: GREAT BLUE HERONS

*Previously:* Introduction to Great Blue Herons. *These columns are from my unpublished manuscript of studies of biology, behaviour, anatomy and trauma in S-E Ontario, with particular interest in care-giving for the starved and injured. See other sequential columns in this Website*

## SOME ANATOMY RELEVANT TO CARE

### Beak and skull


The beak is vascular within, yet its strength is hard external keratin supported by a rigid internal strutwork like cancellous bone. Strong jaw muscles which seize with a granite-hard grip are aided by sharp, rough backward-pointing serrations along the beak edges that control slippery prey. However, the upper mandible has long, flat, soft flaps that protect and nearly conceal the elongated nostrils. A clinic once sent us a heron saying its upper beak was split down the middle! The "fracture" was just the nostrils. This is of course why the beak must never be taped or held shut.

The tongue is long, narrow and mobile. The visible extension of the tongue is propelled by a thin bone that in turn divides into two thin, flat, flexible bones that curl upward around the base of the skull.

### Brain and Eyes

Their heads seem small, and much of their brain space is reserved for their optics: their eyes are large compared to the brain—while the brain is small compared to the body. In a large, starved (but not dehydrated) male whose potential weight was about 2600g, I weighed the eyes: 6 grams each. Then I removed and weighed the delicate 30mm x 34mm brain: 8 grams!

The eyes in all members of the heron family have a distinct characteristic: they tilt slightly inward and downward, allowing them a huge field of view—above, back, forward and especially under the chin. All these views have binocularity (stereopsis.) The eye-colour of Great Blues does not change with sex or age—always yellow, though as usual more greyish in still-growing nestlings.

Unlike mammals, avian eyelids, nictitating membranes and pupillary reactions are controlled separately, which is why people think that owls 'wink' at them (no Great Blue has ever winked at me!). The pupils are thus non-consensual in their response to light, so a light shining into one eye will produce a contraction only in that eye and not the other. Note, however, that when shining a light into one eye, if the light passes through the very thin septal bone separating the eyes, the other eye will

contract too, so the beam should be very narrow, not very bright, and aimed away from the midline.

Great Blue eye injuries are rare—we have only seen four, or about 1% of our admissions. Compare this to Screech Owls—30% have eye injuries! So too are heron brain-damages rare; about 1.8%. Probably this has to do with the flexibility of the long neck when involved in a collision; the head whips away and rarely takes the impact.

## the neck and spine

Those long, flexible necks have about 16 vertebrae, including the tiny axis bone at the skull and the short, stout atlas bone that follows it. You'd think it was easy to count them on a skeleton or on X-rays but it isn't, because anatomically, where does one stop? in *Birds, Their Structure and Function,* King and McLelland say, "According to a widely used convention, thoracic vertebrae are those which carry a complete rib." And then they give a precise description of just what a complete rib is, and continue on for three more pages about bird vertebrae. But I can tell you that when preparing a skeleton these delicate thoracic ribs easily become detached, and on X-rays – mine, anyway—the first ones near the neck barely show, if at all. Another problem is that each species is different; so there is no use comparing a Great Blue skeleton to the usual textbook models of pigeon, parrot or chicken. (These three models, incidentally, are all seed-eaters with large crops and muscular gizzards quite unlike that of omnivores or meat-eaters.) As the vertebrae get closer to the body, they get longer.

There is a certain popular fascination about the kink in a heron's neck and here again it is quite difficult to say where it actually is. In hand you can feel two supposedly fused right-angle bones, but you have no idea what numbers the bones are; when you make a skeleton, skinning, boiling, removing the flesh to clean the bones and pushing a wire through the central canal of loose bones, you may well alter it, and on X-rays I have seen much variety in the placement of the "kink." This is a very active, mobile neck on which every single vertebra is different from its neighbours. I suspect there is no fusion, and it isn't important anyway. It probably has to do with supporting the head when it is extended horizontally, rigidly motionless, waiting for the approach of a moving meal, and as a sort of springboard may also contribute to the power of the strike.

There is no mobile joint in a heron's back as there is above the pelvis in some birds.

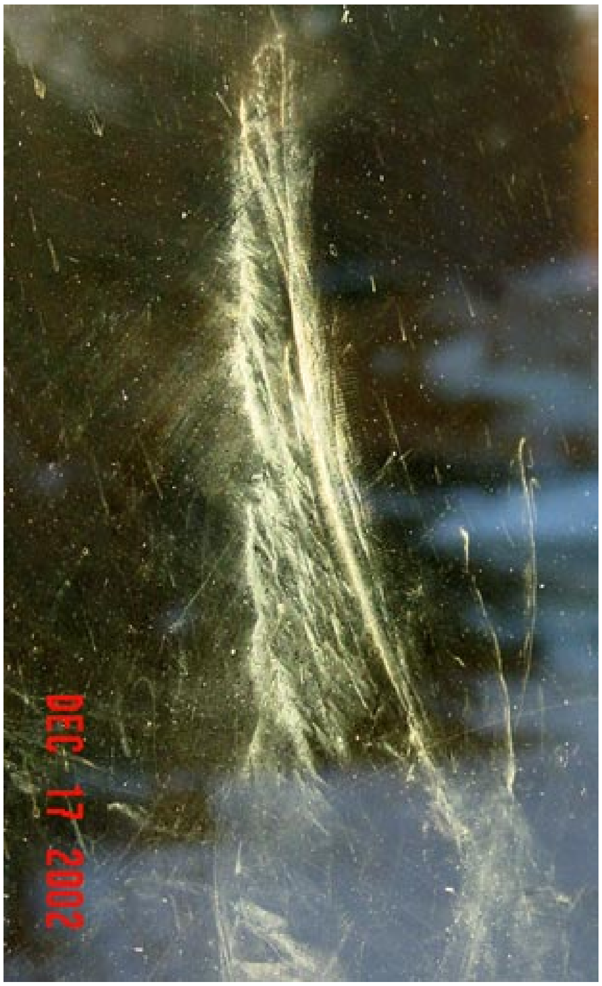
## Skin

As in all birds, it is extremely thin and completely non-elastic, with pre-wrinkled areas established wherever future fat stores may be laid down, especially noticeable at the neck, under the 'armpits' and over the belly. These are **not** signs of dehydration. Again like all birds, there is no subcutaneous tissue and therefore no place to store extra fluids.

Without subcutaneous tissue there are, of course, no sebaceous or sweat glands, which is why bird skin is always dry and why in apteric areas one often finds patches of large thin flakes of skin lifting off as the skin renews itself. Apteric areas are permanently bare and were never intended to grow feathers. Every species has its own pattern where feathers grow; this can be seen on nestling songbirds as they begin to push out stubble.

Heat loss is mainly from some respiratory evaporation which suppliments some radiation, conduction and convection from those bare surface areas. Many birds become hyperthermic under certain unfavourable (usually captive) conditions, especially owls and loons; even herons need be wrapped only lightly for transportation, as I wrote in the *Introduction* column.

## Plumage




***Pigeon wingtip powderdown print on our window***

***Great Blue powder-down patches (whitish)***

Considering how far north Great Blues breed and how much time is spent in and around water, all their plumage is surprisingly sparse, especially their underdown. When you look at the undersides of their wings, it is a translucent anatomy lesson, with veins, arteries, tendons and the humerus easy to see.

One very unusual feature in herons and bitterns is their powder-down feathers: concealed on their breasts and bellies are large, flattened, rumpled, yellowish patches that are pure growths that never stop growing and never moult, continually breaking off at their tips to provide the fine chalky keratin needed for waterproofing. When you touch these peculiar tacky-feeling areas your fingertip receives a dusty pale residue like talcum powder. Herons also have a uropygial (oil) gland at the base of their tails as well, which they use to condition and waterproof their feathers along with the powder-down.

Though many species have powder-down feathers scattered unnoticed throughout their plumage, I know of no others besides the heron family that grow them in large patches. The presence of scattered powder-down feathers is well demonstrated by the pigeon. After bathing, there will be a residue of pale bloom floating on the water, and no matter how long or vigorously the pigeon bathes, it will emerge completely dry!

When birds hit a window they leave an imprint, like a fungus spore-print, a detailed outline in powder-down of whatever body parts led in the collision, as shown in the photo I took of a pigeon strike on our sunroom window. (Thankfully, we have had so far no evidence of window collisions by Great Blues!)

## Great Blue Heron Plumage Changes

Breeding-age herons signal their maturity by their plumage—the classic long plumes on head, neck and back, black crown, white sides of face, black carpals: this is the model for calendars and coffee-table books. Immatures for two, even three years, lack most of those accessories and are seldom seen in photographs. While a heron is just a heron, I think it is useful to recognize the different ages both in captivity and in the wild, just as a vet wants to know the age of a pet, or a doctor the age of a patient. The older the heron, the better the chance at survival because they have experienced hunting and migrating. Behaviour in captivity differs a bit too (see *Introduction* column.)


Fully adult Great Blue. Only yellow beak we have seen

Throughout these columns I use the ornithological terms for aging, as required in continent-wide banding, species identification studies and so on, as briefly explained below.

HY= hatch year bird (first year of life) until Dec 30
SY = second year bird from Jan 1st
TY =third year bird from Jan 1st
AHY = After hatch year from Jan 1st ; used when specific year after HY is unknown
ASY, ATY = after second year, after third year

(Adult, or mature, means the plumage is of breeding age but specifics unknown)
The reference to Jan 1st is because no one knows exactly when any bird was hatched, so in ornithology, all birds have an arbitrary "birthday" on this day. So a HY bird on Dec 31 becomes a SY bird on Jan 1st and so on.

***Fledged Great Blue immatures*** have uniform plumage. In museum drawers, the skins all look alike. In late summer and autumn here, the commonest Great Blue seen is the immature in its first, or hatch-year (HY) identified by its short, dark gray cap, lack of plumes or black feathers anywhere, soft colours, and pale rust carpals. Of the herons we receive, 83% are these juveniles in their first year.

Still sexually immature in their second year (SY, or some researchers call them yearlings) and probably even in their third year (TY) they gradually show further development of the plain slate cap as the midline of the crown whitens and begins to show through the slate feathers, and the head and neck plumes begin to lengthen. In hand, ruffling the crown-feathers is sometimes necessary to expose the new white feathers to differentiate HY from SY. Nutrition probably hastens or retards the plumage changes; I have found a wide range of crown progression in SY herons, and have identified only five likely TY birds in hand because of advanced yet incomplete development of plumes, body and head plumage. In the wild (distant) they would still look more like juveniles than adults.

***The breeding adult.*** A fully mature bird is usually shown with a yellow beak, black carpals, long dramatic plumes from the cap, neck and back, and a lot of black and white on the head and face. However, the only fully yellow beak I have recorded was a female in early April (photo).

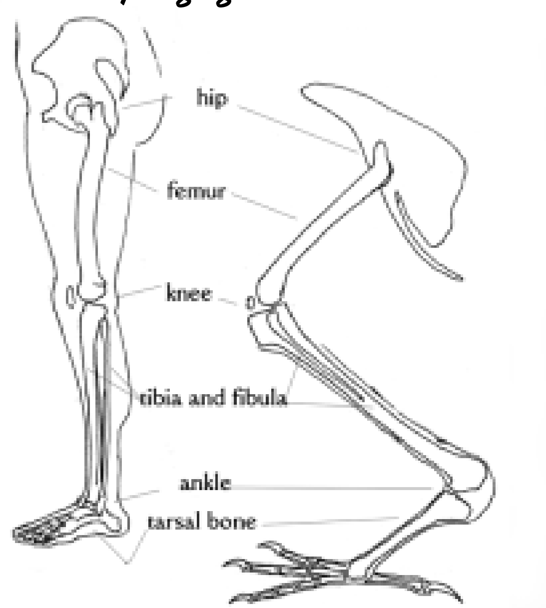
## Digestive tract

Herons are grazers and do not have crops, which is a receiving sac high in the throat to contain a large temporary meal: I have found them in grebes, woodcock grouse, Turkey Vultures, osprey and all other hawks and eagles, pigeons and doves, goldfinches, redpolls, some woodpeckers, cuckoos, and humming-birds. For herons, bonus meals go right into the baggy esophagus and slide down into the stretchy stomach for further digestion. The stomach is so distendible that it can reach right down to the cloaca and even past it; one heron swallowed a large smooth branch which stretched the stomach past the cloaca. There is no gizzard for grinding, and hard or indigestible bits like bones, teeth, fur and so on are regurgitated in castings.

Textbooks often mention a second stomach, which is at the end of the real stomach, but it is more like a very small, tough, filtering chamber in which I have occasionally found hairs and once, a nematode. I have also found these small chambers in two Turkey Vultures and a Ring-necked Grebe.

About the terms *stomach* and *gizzard*: technically, the organ of digestion is the stomach, which has (or hasn't) a tough muscular grinding portion of its wall called the gizzard. In some species the gizzard is all of the digestive organ (or vice-versa) while at the other extreme there may be no grinding portion at all, depending on the biology of the bird and what he eats.

comparing leg of man and bird




Like all birds, the intestines end in the cloaca, which is a busy and complicated place of several compartments. Sperm is deposited in it, ducks and some other species have a phallus (penis) in it, and fully formed eggs arrive in it. Urine empties into it, fecal matter empties *through* it, the two separate wastes mixing to produce the slightly liquid droppings we are all familiar with. The urine output is little enough that no separate bladder is needed as it is with mammals.

## Legs

Like many birds the femur is contained entirely within the body skin. To help visualise what this means, imagine using a tape-measure to measure the circumference of your own thigh (which contains the femur); this cannot be done on most birds, and definitely not on herons, any more than you can measure the circumference of your collarbone. Because a bird's body is usually nearly horizontal, the femur is up against the bird's side during flight and close to the side while standing, perching and walking; it extends during push-off. This is important to understand, because it means that *a)* the partially folded leg is much longer than it looks during normal activities; *b)* that in flight and at rest the femur is against the side of the body and so a fracture of the femur often means internal injuries are incurred at the same time; and *c)* a fractured femur cannot be accessed for casting.

***Rare golden legs. Note band on tibia--best place for sight reports***

Like other birds, herons have no fibula to speak of; it is more like a thin bit of icicle clinging to the proximal tibia. The part of the heron's leg that contains the tibia is usually partly concealed by feathers and ends at the ankle, as ours do. The knobby joint in the leg is actually his ankle; if these joints seems confusing at times, compare the direction of each joint to ours. The knee always points forward, the ankle always points backward.

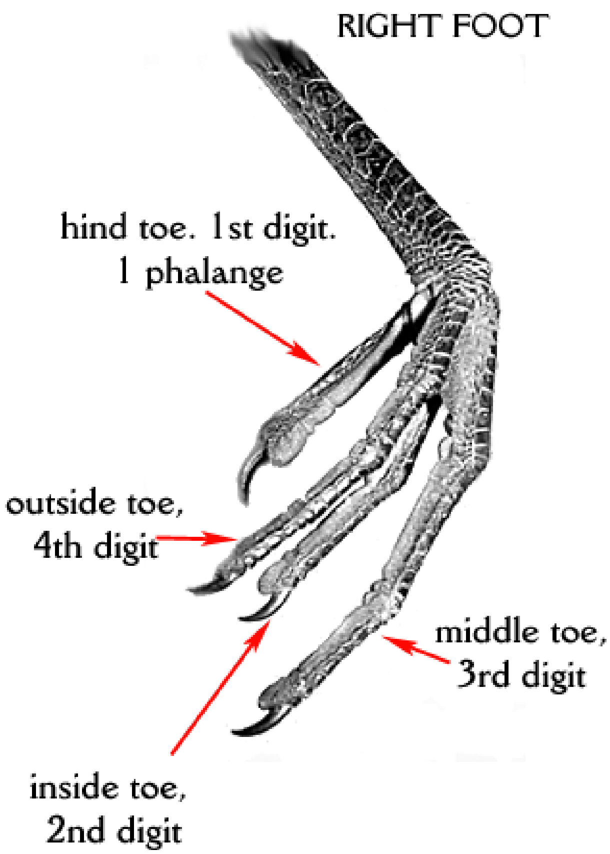
The tarsus is what is generally called the "leg." Tarsi and feet have no muscle. Well, to be exact, some raptors do have two tiny muscles in each tarsus that operate the hind toe (hallux), but I doubt if this includes the herons as they have no need for much muscular control of their halluxes. The covering of the legs is scaly keratin, very difficult to suture.

Though the legs are nearly always very dark, we have had four herons whose legs were a strange golden colour. Two proved to be female, a third, released, was a bit small and so probably female also. A fourth was male. Two of the four were adult, two hatch-year.

## Feet

What is generally called "the foot" is really the four toes, as the tarsal bone mammals have in their feet has been extended to become one of the long bones of the leg. Each foot has a small web for marsh walking and each toe, or *digit,* is made up of a different number of bones called *phalanges*. At ground level is digit # 1, a long hind toe or *hallux*, the equivalent of a thumb, which has one phalange (or phalanx; the labelling in anatomy books is occasionally confusing) not including the small terminal bone that is the claw. Of the three forward toes, if we start with the inner or digit # 2, it has *two* phalangeal bones and the little claw-bone. The longest is the middle toe, digit # 3, and has *three* bones and the claw; and the outside toe, digit # 4, has *four* bones and the claw.

The keratin on top of the feet (toes) is almost black, baggy and made up of plates, while the soles are yellowish flesh. The yellowish sole turns dark when the toes are dying (photographs will be in a later column about trauma). Inside the toes I have only found some yellowish tissue akin to fat in places, and strong wide white tendons, one on top of each toe to extend, one underneath each toe to flex; they come from the sheathed bundle that make up the Achilles in the tarsus. Leghold traps often cause the death of parts of toes, but herons seem to manage quite well anyway.




The names of the toe-parts are not important. It is useful, though, to know how many bones there are in each toe, because it is not uncommon for herons to lose digits. What does matter on admission is to look carefully at the toes and the base of the tarsus for swelling, and to check the soles for cuts and colour, and to record the findings.

Lots more about foot, leg and other injuries in future chapters.

Kit Chubb

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